

NIGERIA'S INDUSTRIAL DEVELOPMENT, CORPORATE GOVERNANCE AND PUBLIC POLICY



Editors
Ndubisi I. Nwokoma
Wakeel A. Isola

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**Essays in Honour of Michael O. Adejugbe
Professor of Industrial Economics**

Edited by

**Ndubisi I. Nwokoma
Wakeel A. Isola**

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S. O. Olayiwola, T. A. Oluseyi-Awe and T. F. Ajagbe

Introduction

Since the seminal contributions of Becker (1964), Mincer (1974) and Schultz (1961), economists have found it useful to characterise the benefits of education by means of the notion of investment in human capital. This idea captures the fact that investment in human beings, like investment in tangible forms of capital such as buildings and industrial equipment, generates a stream of future benefits (Jorgenson and Fraumeni, 1992). Many economists have held that economic growth is primarily a matter of amassing more tangible capital thereby treating education as a consumer good. However, growing recognition has been given to the fact that education is an investment industry which means that the development of people is as important as the growth and development of other industries in an economy and that growth may be fostered by the development of human talent. Over time economists have offered variety of theories and model for examining the relationship between education and economic growth (see Lucas, 1988; Romer, 1990; Rebelo, 1991, Grossman and Helpman, 1991; Francis and Iyare, 2006). These models stressed the role of human capital accumulation in economic growth (Chakraborty, 2005).

The growth in industrial output has historically been a key element in the successful transformation of most economies that have witnessed sustained rises in their per capita incomes, the recent example being that of the Newly Industrialised Countries and their success in exporting manufactured goods (Söderbom and Teal, 2002). In most African countries, performance of industrial sector has been poor over the last decades. For example, in the last decades Nigeria has only about 5 per cent of its GDP coming from the manufacturing sector, compared to the 20 per cent levels for South Africa and Mauritius (Söderbom and Teal, 2002). Since the late 1960s the Nigerian economy was based mainly on the petroleum industry. In the 1970s, a series of increases in the international oil price generated substantial windfall revenues for the government but these oil price shocks were a mixed blessing. Like many other African countries, Nigeria's early independence years had seen an industrial strategy that relied heavily on import substitution. This appeared to work relatively well initially with the share of manufacturing to GDP increasing from 2 per cent in 1957 to 7 per cent in 1967 (Utomi,

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1998). The massive oil revenues meant that this strategy could be intensified; consequently, the 1970s witnessed huge investments in state-owned enterprises. While this implied rapid expansion of the industrial sector, subsequent returns on investment projects were much below expectation.

The idea of linking higher education and economic growth was conceptualised throughout the world in the 20th century. Responding to the needs of industries during that period, higher education expanded approximately 200 times beyond the enrolment level in 1900 (Schofer & Meyer, 2005). Higher education was seen as a major driver of economic growth and development. There are lots of empirical studies on the individual benefit of higher education but little is known about the effect of higher education expansion on economic growth. This study investigates the effect of higher education expansion on the growth of the industrial sector output in Nigeria. The rest of the paper is divided into five sections. A summary of the performance of the Nigeria's industrial sector and tertiary institutions enrolment trends in Nigeria are examined in section two. Section three embodies the review of literature on the role of education on growth and development and theoretical framework, section four contains research methodology, data requirement and description and estimation procedure. Section five is pre-occupied with presentation and discussion of the results *while section six contains conclusion and policy recommendation.*

The Nigerian Tertiary Education System and Tertiary Institutions Enrolment Trends in Nigeria

Lawanson (2009) observed that the importance of higher education in national development in Nigeria is reflected in the goals for tertiary education which includes development of individual's intellectual capacity to understand and appreciate their local and external environments, integration of the nation and to cement national unity, contribution to national development through high-level manpower training, promotion of national and international understanding and interaction, developing and inculcating proper values for the survival of the individual and the society, acquisition of both physical and intellectual skills, which will enable individuals to be self-reliant and useful members of the society, promotion and encouragement of scholarship and community service among others. The establishment of Yaba Higher College in 1934 marked the beginning of higher education in Nigeria. The purpose was to produce assistants, secondary school teachers and semi-professionals who would relieve colonial administrators of menial tasks (Adedeji and Bamidele, 2002).

The establishment of the Ibadan University College was the final metamorphic stage of Yaba Higher College in 1948 with 104 students. By 1950's when two of the regions in Nigeria attained self-government, it became clear that unless the training of high level manpower was accelerated, it was not likely that Nigerians would adequately take full control of their affairs at independence. Okebukola (1998) highlights the report of the

Ashby Commission, which was set up to conduct an investigation into Nigeria's needs in the field of education (post school certificate and higher education in the next twenty years). This led to the establishment of three polytechnics, one in each administrative region of the country: the Nigerian Colleges of Arts, Science and Technology Zaria for the then northern region (1952); Ibadan for the Western region (1954) and Enugu for the Eastern region (1955). These polytechnics were however phased out in 1962 when their assets were taken over by the three of the new Universities; Ahmadu Bello University Zaria; University of Ife (now Obafemi Awolowo University) and University of Nigeria, Nsukka respectively (Ugwuonah and Omeje, 1998). Universities were established in the then three regions. In the East, University of Nigeria (UNN) was established in 1960, in the North, Ahmadu Bello University Zaria was founded in 1962 while in the West, University of Ife (now Obafemi Awolowo University) was set up in 1961 and according to Babalola (1999) the University College Ibadan (UCI) became a full-fledged University in 1962. Also in 1962, the University of Lagos, Akoka was established and as a city University. University of Benin was also established in 1972 (Olujuwon, 2002). These six Universities constitute Nigeria's first-generation Universities.

The increase in the number of states following the oil boom period and geo-political restructuring in 1975 increased the demand for more institutions. Seven additional Universities in Calabar, Ilorin, Jos, Kano, Maiduguri, Port-Harcourt and Sokoto were set up between 1972 and 1975 and they constitute the second generation Universities. State Universities came up in 1981. Also, the growth of Polytechnics and Colleges of Education were phenomenal and each state has at least one college of education or University. Continuous creation of states from the 1980s on political and economic grounds caused more demand for federal Universities by the states that had none. This in turn led to the creation of the 3rd generation federal Universities: Owerri in 1980; Akure in 1981; Abeokuta in 1982; Yola in 1982; Minna in 1982; Bauchi in 1988; Makurdi in 1988; Abuja in 1990; Uyo in 1991; Awka in 1992; and Umudike in 1992. Among the 3rd generation federal Universities were 5 universities of technology (Owerri, Akure, Minna, Bauchi and Yola) and 3 Universities of agriculture (Makurdi, Abeokuta and Umudike), which were established as specialised Universities to focus attention on the development of technology education, research and development (R&D) as well as the production of high-level manpower for industry, commerce and agriculture and the public service. According to Okojie (2008) the Nigerian Tertiary Sector has the following number of institutions: 83 approved Colleges of Education/ Institute (made up of 23 Federal, 43 State and 17 Private); 115 approved Polytechnics/Monotechnics (made up of 53 Federal, 46 State and 16 Private); there are 7 Polytechnics offering NCE programmes (which are made up of 2 Federal and 5 State); there are also 3 Polytechnics and 5 Colleges of Education offering degree programmes and 93 approved Universities (made up of 27 Federal, 32 State and 34 Private).

The beginning of the 21st century experienced an explosion in the enrolment rate into tertiary institutions in Nigeria. Nearly one million students are enrolled in more than 200 institutions in Nigeria. Nwankwo (1992) argued that enrolment in higher education increased from 14,468 in 1976 to 176,700 in 1990. This pace of educational growth in Nigeria particularly since political independence is unparalleled elsewhere among new African nation's, (Adesina, 1982). In 1998, Nigeria had 63 colleges of education, with a total enrolment of 105,817 students; 45 polytechnics, with 216,782 students; and 36 universities, with 411,347 students. In addition, 87 monotechs, about 100 schools of nursing and midwifery, and other professional training institutions had an estimated combined enrolment of 120,000 students. Enrolment in Nigerian Universities doubled every 4 to 5 years in the 1960s, 1970s, and 1980s. In two decades, the number of University students increased eightfold, from about 55,000 in 1980 to more than 400,000 in 2002 (Bollag, 2002). It slowed down somewhat in the 1990s growing at an average rate of 12% and approximately doubling over the decade of the 1990s. Total enrolment into tertiary institutions stood at 1,653,344 as at 2006 (NBS, 2007).

Figure 1 below shows the sectoral distribution of tertiary institutions in Nigeria while figure 2 shows the growth of student's enrolment in the various higher institutions of learning in Nigeria. The growth rate of student's enrolment was observed to be on the high side for a developing country like Nigeria compared with the number of tertiary institutions available. Table 1 also shows the growth rate of enrolment between 1976 and 2007. The most significant growth is that of 1994 where the number of students increased by 159% of what it was in the previous year. This shows that the growth rate of enrolment is very high. However this did not match the provision of infrastructures necessary to cater for the increasing population. Enrolments grew at annual rates of 12% - 15% as student population had more than doubled the Ashby Commission projections.

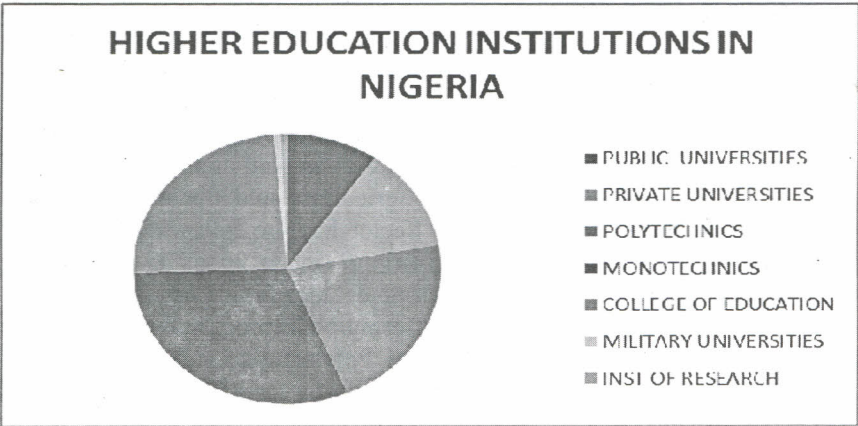


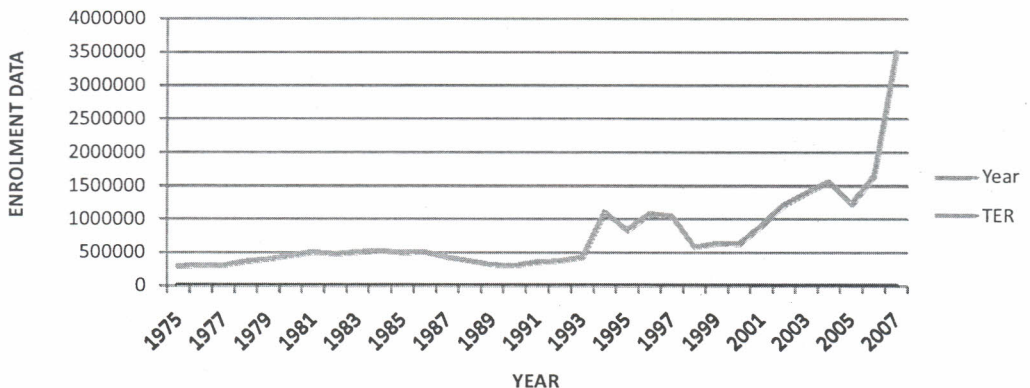
Figure 1: Sectorial Distribution of Higher Education Institutions in Nigeria
Source: National Bureau of Statistics (NBS), 2007

Table 1: Growth Rate of Students Enrolment between 1976 and 2007 in Tertiary Institutions in Nigeria

Year	Growth Rate	Year	Growth Rate
1976	7.376993	1992	5.442027
1977	-3.496247	1993	13.94154
1978	21.81619	1994	159.9781
1979	9.361429	1995	-24.76721
1980	13.56469	1996	29.72191
1981	10.95965	1997	-3.552726
1982	-4.336354	1998	-44.21052
1983	4.624510	1999	8.850809
1984	4.082232	2000	-0.302130
1985	-5.144495	2001	42.93409
1986	2.427137	2002	34.78437
1987	-15.98705	2003	14.53918
1988	-12.21146	2004	12.24095
1989	-16.32473	2005	-21.67766
1990	-5.361147	2006	34.94670
1991	19.26331	2007	36.89071

Source: National Bureau of Statistics (2007)

TERTIARY SCHOOL ENROLMENT FROM 1977 TO 2007

**Figure 2: Growth of Enrolment in Various Higher Institutions of Learning in Nigeria**

Source: National Bureau of Statistics (2007)

Development and Performance of Industrial Sector in Nigeria

The development of industrial activities in Nigeria has passed through three phases vis the pre-colonial era, the early post-colonial era, and events since the mid-1980s (Ajayi, 2007). Craft industries were predominant in the pre colonial era and prominent among these craft industries that featured in local and inter-regional trade were artifacts of wood, brass and bronze, leather, hand-woven textiles and bags, iron workings and fire burnt pottery from local clay (Ajayi, 2007). These craft industries featured in different locations in a close contact with the available raw materials. The advent of Europeans brought

about the first widely recognised forms of modern industrialisation in Nigeria and Onyemelukwe (1983) in Ajayi (2007) noted that Nigeria has embraced the factory type of industrialisation as the main panacea to her underdevelopment. As part of the reconstruction efforts after the political crisis which culminated into civil war in the 1970s, the Second National Development Plan, 1970-74 had rapid expansion and diversification of the industrial sector of the economy and promotion of the establishment of industries which catered for overseas markets in order to earn foreign exchange among others (Ajayi, 2007).

Over the years the industrialisation strategies in Nigeria had been import substitution strategy, export promotion strategy, balanced development strategy and local resource-based strategy. Anyanwu et al. (1997) observed that Nigeria adopted import substitution strategy after independence to lessen over-dependence on foreign trade and save foreign exchange. But the result of this strategy turned out to be a mere assemblage of manufacturing items rather than domestic production of them. This pitfall led to the replacement of import substitution strategy with export promotion strategy which involves the production and exportation of new product and those originally imported. However, inadequate incentives and raw materials led to the failure of export promotion strategy (Anyanwu et.al; 1997). Balanced development strategy was introduced due to the lopsided development of the industrial sector. The main objective of balanced development of all industries was to encourage greater linkages within the industrial sector. This is to create intra-industry and inter-sectional linkages to increase intra-industry transactions. Local resource-based industrialisation strategy was introduced due to the dwindling of oil revenues and foreign exchange for the importation of raw materials and spare parts (Anyanwu et al., 1997). Industries are thus encouraged to find local substitute of the raw materials used for their productive activities.

One way of accessing the performance of a sector of the economy is looking at the contribution of the sector to the total output produced in the economy. Table 2 below shows the contribution of the Nigeria's industrial sector to the real gross domestic product from 1960 to 2008. The table shows that industrial sector contribution recorded an upward trend in the contribution to real gross domestic product (real GDP) from 1960 to 1966. It contributed 5.9% to 14.2% from 1960 to 1966 before it falls to 14.0% in 1967 and 11.2% in 1968. The table shows a general fluctuation of industrial sector contribution to real GDP from 1960 to 2008. The table further shows that the contribution of manufacturing sub-sector ranges from 3.8% to 11.1% while that of crude petroleum sub-sector ranges from 0.4% to 40.5%. Also solid minerals contribution ranges from 0.2% to 2.6% for the whole of the period. However, manufacturing sector contributed mostly from 1960 to 1969 until the crude petroleum took the lead in 1970 with 11.0% and maintain that lead throughout the years. In the mid-eighties the industrial sector contribution ranges from 38.7% in 1981 to 46.2% in 1990. This is the periods in which the industrial sector contributed mostly to the real GDP in Nigeria.

Table 2: Nigeria's Industrial Sector Contribution to Real Gross Domestic Product (₦ Million)

Year	Total GDP	Crude Petroleum & Natural Gas	% of GDP	Solid Minerals			% of GDP	Manufacturing			% of GDP	Total Industrial Output	% of GDP
				Coal Mining	Metal Ores	Quarrying & other Mining		Oil Refining	Cement	Other Man.			
1960	2,489.0	11.0	0.4	1.8	9.0	9.8	0.8	-	-	114.0	4.6	145.6	5.9
1961	2,501.2	23.2	0.9	2.0	9.4	10.2	0.9	-	-	127.6	5.1	172.4	6.9
1962	2,597.6	29.0	1.1	2.0	9.6	13.4	1.0	-	-	146.4	5.6	200.4	7.7
1963	2,825.6	32.8	1.2	1.8	10.0	14.2	0.9	-	-	170.7	6.0	229.5	8.1
1964	2,947.6	61.8	2.1	2.4	10.4	15.0	0.9	-	-	181.0	6.1	270.6	9.2
1965	3,146.8	116.8	3.7	2.8	10.8	19.4	1.0	-	-	221.0	7.0	370.8	11.8
1966	3,044.8	179.2	5.9	1.6	10.6	19.0	1.0	-	-	221.6	7.3	432	14.2
1967	2,527.3	137.0	5.4	0.2	10.4	16.2	1.1	-	-	190.0	7.5	353.8	14.0
1968	2,543.8	61.0	2.4	0.0	10.4	13.5	0.9	-	-	200.4	7.9	285.3	11.2
1969	3,225.5	232.0	7.2	0.0	9.6	19.7	0.9	-	-	263.4	8.2	524.7	16.3
1970	4,219.0	465.6	11.0	0.2	8.6	27.1	0.9	-	-	317.6	7.5	819.1	19.4
1971	4,715.5	657.2	13.9	0.7	7.9	38.5	1.0	-	-	307.7	6.5	1012	21.5
1972	4,892.8	777.0	15.9	1.0	7.3	48.3	1.2	-	-	381.1	7.8	1214.7	24.8
1973	5,310.0	882.8	16.6	0.9	9.4	50.7	1.1	-	-	472.7	8.9	1416.5	26.7
1974	15,919.7	3,392.7	21.3	-	-	352.7	2.2	-	-	1,182.0	7.4	4927.4	31.0
1975	27,172.0	5,770.6	21.2	-	-	505.9	1.9	-	-	1,186.5	4.4	7463	27.5
1976	29,146.5	6,979.0	23.9	-	-	717.3	2.5	-	-	1,463.6	5.0	9159.9	31.4
1977	31,520.3	7,071.6	22.4	-	-	833.4	2.6	-	-	1,695.6	5.4	9600.6	30.5
1978	29,212.4	6,225.6	21.3	-	-	647.2	2.2	-	-	2,169.0	7.4	9041.8	31.0
1979	29,948.0	7,637.6	25.5	-	-	627.0	2.1	-	-	2,599.2	8.7	10863.8	36.3
1980	31,546.8	6,754.3	21.4	-	-	682.7	2.2	-	-	3,489.9	11.1	10926.9	34.6
1981	205,222.1	73,019.7	35.6	1.3	44.2	2,169.7	1.1	150.5	587.2	13,100.3	6.7	89072.9	43.4
1982	199,685.3	65,227.8	32.7	0.6	33.0	2,211.6	1.1	156.4	688.4	14,786.8	7.8	83104.6	41.6
1983	185,598.1	59,458.0	32.0	0.6	27.1	1,684.7	0.9	114.6	243.8	10,439.0	5.8	71967.8	38.8
1984	183,563.0	66,884.3	36.4	0.8	20.7	1,450.2	0.8	112.9	153.3	9,266.6	5.2	77888.8	42.4
1985	201,036.3	72,152.0	35.9	1.5	15.0	896.5	0.5	160.8	766.6	11,105.1	6.0	85097.5	42.3
1986	205,971.4	70,791.0	34.4	1.5	3.5	482.3	0.2	80.9	828.7	10,673.1	5.6	82861	40.2
1987	204,806.5	69,014.8	33.7	1.3	11.7	527.1	0.3	119.0	705.2	11,217.4	5.9	81596.5	39.8
1988	219,875.6	70,837.0	32.2	0.9	13.3	580.8	0.3	136.0	919.1	12,658.8	6.2	85145.9	38.7
1989	236,729.6	79,321.9	33.5	0.9	13.6	623.8	0.3	177.0	967.4	12,887.1	5.9	93991.7	39.7
1990	267,550.0	108,233.4	40.5	0.9	12.1	652.6	0.2	174.9	680.0	13,847.5	5.5	123601.4	46.2
1991	265,379.1	91,313.9	34.4	1.6	8.3	678.7	0.3	186.5	756.6	16,135.4	6.4	109081	41.1
1992	271,365.5	93,614.3	34.5	1.0	4.9	705.2	0.3	182.8	770.4	14,404.0	5.7	109682.6	40.4
1993	274,833.3	93,810.1	34.1	0.4	5.1	740.5	0.3	181.0	799.0	13,809.1	5.4	109345.2	39.8

Source: Central Bank of Nigeria Statistical Bulletin, 2008

Table 3 below shows total industrial output and our index of measuring higher education expansion in Nigeria from 1977 to 2007. The table shows that as tertiary institution enrolment, graduate turn-out, government recurrent educational expenditure and government capital educational expenditure increases, the total industrial output also increases over the years. This is an indication of a direct relationship between tertiary institution enrolment, graduate turn-out, government recurrent educational expenditure, government capital educational expenditure and industrial output.

Table 3: Total Industrial Output and Index of Higher Education Expansion

Year	Total Industrial Output	Tertiary Institution Enrolment	Government Recurrent Educational Expenditure	Government Capital Educational Expenditure	Graduate Turn-Out
1977	31,520.34	299,814	173.72	500.0	49,292
1978	34,540.09	365,222	167.29	301.4	47,050
1979	41,974.70	399,412	151.23	533.2	48,698
1980	261,225.20	453,591	155.81	952.6	57,742
1981	94,325.02	503,303	165.43	440.9	74,607
1982	101,011.23	481,478	187.93	488.4	87,066
1983	110,064.03	503,744	162.15	345.5	104,683
1984	116,772.18	524,308	198.9	144.9	116,822
1985	134,603.32	497,335	258.6	180.7	126,285
1986	134,603.32	509,406	262.71	442	135,783
1987	193,126.20	427,967	225.01	139.1	150,613
1988	263,294.46	375,706	1458.8	281.8	219,119
1989	382,261.49	314,373	3011.8	221.9	307,702
1990	472,648.75	297,519	2402.8	331.7	326,557
1991	545,672.41	354,831	1256.3	289.1	368,897
1992	875,342.52	374,141	291.3	384.1	376,122
1993	1,089,679.72	426,302	8882.38	1563	383,488
1994	1,399,703.22	1,108,292	7382.74	2405.7	117,808
1995	2,907,358.18	833,799	9,746.4	3,307.4	391,035
1996	4,032,300.34	1,081,620	11496.2	3215.8	689,619
1997	4,189,249.77	1,043,193	14853.5	3808	862,023
1998	3,989,450.28	581,992	13589.5	12793	941,329
1999	4,679,212.05	633,503	43610.7	8516.6	983,689
2000	6,713,574.84	631,589	57956.6	23342.8	1,032,873
2001	6,895,198.33	902,756	39882.6	19860	1,152,874
2002	7,795,758.35	1,216,774	80530.9	9215	1,354,965
2003	9,913,518.19	1,393,683	64782.2	14680.3	4585963
2004	11,411,066.91	1,564,283	76524.7	21550	1,652,846
2005	14,610,881.45	1,225,183	82795.1	27440.8	1,589,150
2006	18,564,594.73	1,653,344	87294.6	35791.8	1,613,125
2007	23,280,715	3,500,000	107529	48293.5	2,041,268

Source: National Bureau of Statistics, 2007; National Productivity Centre Publications, 1994

These values represent the sum of graduates from the Universities, Polytechnics and Colleges of Education.

Literature Review and Theoretical Framework

Easterlin (1981) formulated a hypothesis using an historical approach to explain the underdevelopment in some countries of the world by the late arrival of mass primary education, which delayed the process of technology transfer. He argued in the study that the reason why economic growth has spread so slowly among the nations of the world is because of geographical diffusion of technology. However he linked this limitation to both the quantity and quality of the educational systems. In his review of the literature of education-growth relationship, Psacharopoulos (1973) claims that in general, the rate of

return to education are higher for primary education than for higher education, and that primary education contributes more to growth in developing countries than in developed countries.

Studies related to the impact of tertiary education on economic growth provided mixed results. This is explained by a variety of factors among which is the fact that different studies used different variables (e.g. enrolment rates as opposed to literacy rates of the working population). Because of this Graff (1995) provided some explanations for higher education puzzle. One is the law of diminishing returns, which states that the marginal contribution of education to productivity growth decreases with the accumulation of human capital stocks. This leads to the view that the major beneficial impact of computerisation and of the corresponding tertiary education on productivity and growth are over in the developed countries (Gordon, 2000). Lall (2001:149) analysed the correlation of three particular indicators with per capita income, using data on 120 countries. He finds that tertiary technical enrolment is highly correlated with incomes. These findings suggest that wealthier countries have a greater financial ability to invest in human capital at the higher levels of education than poorer countries.

A different view of the role of education in the economic success is that education has positive externalities. Many classical economists argued strongly for governments support for education on the ground that positive externalities in the society as a whole would gain from a more educated labour force when populace is high (Van-Den-Berg, 2001). In recent times, there are numerous recent empirical studies that have investigated the effects of higher education on economic growth in different countries. Stevens and Weales (2003) identify two basic reasons for expecting to find some link between education and economic growth. One is the basic assumption that living standards has increased so much over the years because of education. This is evidenced over the last millennium since 1800 as well as the success stories of economies such as the East Asian Tiger economies. Countries have achieved an increase in the living standards of its people since the evolution of education into their system. One of the important factors responsible for the growth of the East Asian Tiger economies is that the values and cultural traditions of these economies gave high priority to education, especially higher education and this has helped in developing their human resources and has enabled scientific and technological inventions to be absorbed and applied relatively easy.

Khorasgani (2008) in his study of higher education and economic growth in Iran highlights the role Universities and other higher education institutions play in educating individuals in order to foster their abilities in meeting the needs of all sectors of human activities. The study was conducted using multivariable time series data. The variables used were annual logarithmic gross domestic product as the dependent variable while physical capital, human capital and research expenditures were the independent variables. The study showed that higher education had a positive effect on economic growth in Iran

both in the short run and in the long run. Also, in a study of six developed countries, De Meulemeester and Rochat (1995) shows that higher education had a strong causal impact on economic growth in France, Japan, Sweden, and the United Kingdom, but no impact in Australia and Italy. The authors concluded that higher education is a necessary condition for growth but not sufficient. They argued that social, political, economic structures and the technological level of the society to which the educational system belongs are such that graduates can actually make use of their accumulated knowledge.

Gyimah-Brempong et al. (2006) investigates the effect of higher education on economic growth in African countries using panel data over the period from 1960 - 2000. A modified neoclassical growth equation and a dynamic panel estimator were used in investigating this relationship. They found that all levels of education, especially higher education have a positive and significant effect on the growth rate of per capita income in African countries. The growth elasticity of higher education was estimated to be about 0.09, an estimate that is twice as large as the growth impact of physical capital investment. While this is likely to be an overestimate of the growth impact of higher education, it points to the need for African countries to effectively use higher education in growth policies.

Morote (2004) observed that in determining the growth in emerging market economies, key elements to be considered are higher education and economic growth. He argued that the educational attainment of the population helps in increasing economic growth. In his empirical analysis of the causal relationship between higher education enrolment and per capita GDP using granger causality approach in Mexico and Peru, he found that there exists a causal relationship from higher education/employment to economic growth in both countries. The results of this study confirms that employment rate is a key factor in the higher education and economic growth relationship and that institutional, sociological and economic factors help in explaining the link between the two. Hence, he concluded that investment would not contribute to improvements in economic growth if policy makers did not relate education to labour and that higher education must provide the education related to and require by the labour market.

Otu and Adenuga (2006) identified the need for human capital development for economic growth in Nigeria by examining the relationship between economic growth and human capital development in Nigerian. They argued that investment in human capital, through the availability of infrastructural requirements in the education sector accelerates economic growth. Odekunle (2001) also affirms that investment in human capital has positive effects on the supply of entrepreneurial activity and technological innovation. A high-skilled labour force may foster economic growth through more productive enhancing innovations and a better adoption of new technology. However, Ayara (2002) argued that education has not had the expected positive growth impact on economic growth in Nigeria. The reason for this according to him are that educational capital go

into privately remunerative but socially unproductive activities, slow growth in the demand for educated labour which leads to brain drain and the failure of education system in Nigeria such that schooling provides few (or no) skills.

Theoretical Framework

Endogenous growth theory assumed that increased productivity is related to knowledge and that behaviour of the people is responsible for the accumulation of physical capital. It attempts to incorporate human element into the traditional Solow model (Bloom, 2006). This work employed endogenous growth theory as its theoretical framework. According to endogenous growth theory, improvements in productivity can be linked to a faster pace of innovation and extra investment in human capital. Mankiw, Romer and Weil (1992) introduced human capital as a separate input into a standard Cobb-Douglas production function by extension of the Solow model. The production function generated is a Cobb-Douglas production function of the form:

$$Y_t = K^{\alpha} H^{\beta} (A_t L_t)^{1-\alpha-\beta} \dots\dots\dots(1)$$

Where Y = Output

K = Physical capital stock in any period t

H = Stock of human capital in any period t

L = Labour force in any period t

A = Level of technology in any period t

α and β = Marginal products of capital and labour respectively.

This lead to a Hicks neutral shift in the production function and an increase rather than decrease return on investment. The theory shows the impact of human capital on rapid economic growth.

Methodology

To capture the relationship between higher education and industrial sector output growth in Nigeria, endogenous growth model is employed. A Cobb-Douglas production function with constant returns to scale is considered where human capital is treated as an independent factor of production in the human capital augmented growth model to examine the effect of higher education expansion on industrial sector growth in Nigeria. We adopt Loening (2002) model as follows:

$$Y = A \cdot K^{\alpha} \cdot H^{\beta} L^{(1-\alpha-\beta)} \dots\dots\dots(2)$$

Where Y is defined as total output of the industrial sector; A is the total factor productivity; K is physical capital, H is human capital and L is labour. The logarithmic conversion of equation (2) above yields the structural form of the production function as:

$$\ln y_t = \ln A + \alpha \ln k_t + \beta \ln h_t + u_t \quad \text{-----}(3)$$

Where $y = Y/L$ = output per worker
 $k = K/L$ = capital per worker
 $h = H/L$ = average human capital

In equation 2, human capital was taken to affect the technology parameter directly rather than as a factor of production. The Cobb-Douglas production function with constant returns to scale can therefore be given as:

$$Y = A \cdot K^\alpha \cdot L^{(1-\alpha)} \quad \text{.....}(4)$$

Express as a logarithmic expression equation (4) becomes:

$$\ln Y = \ln A + \alpha \ln K + (1-\alpha) \ln L \quad \text{-----}(5)$$

Total factor productivity in this model is taken to be a function of exogenous variables, such as graduate turnout, government expenditure on education, tertiary school enrolment. The argument is that an educated labour force performs a major role in the determination of productivity level instead of entering the production function as a factor. The expenditure on education is assumed to influence the level of human capital proxy by graduate turnout which is expected to cause improvements in total factor productivity. In addition, higher level of human capital proxy by graduate turnout speeds up the adoption of foreign technology that is expected to balance the knowledge gap between the developed and the developing countries. (Nelson and Phelps, 1966; Loening, 2002) Consequently, the technology parameter in equation (5) is non-constant which is allowed to be dynamic with time, The technology parameter can be presented as:

$$\text{RIND} = \beta_0 + \beta_1 \text{GTO} + \beta_2 \text{TER} + \beta_3 \text{GCE} + \beta_4 \text{GRE} + U_t \quad \text{----}(7)$$

The natural logarithm of both sides of equation (7) which assume linearity among the variables gives:

$$\log \text{RIND} = \beta_0 + \beta_1 \log \text{GTO} + \beta_2 \log \text{TER} + \beta_3 \log \text{GCE} + \beta_4 \log \text{GRE} + U_t \quad \text{----}(8)$$

- Where,
- RIND = Real Industrial sector output.
 - GTO = Level of human capital proxied by Graduate Turnout of tertiary institutions.
 - TER = Students enrolment in tertiary institution.
 - GRE = Government recurrent expenditure on education.
 - GCE = Government capital expenditure on education.

As mentioned earlier Y is the total output of the industrial sector and this is represent here as IND and K which is physical capital that is omitted to be able to concentrate on the human capital aspect of the model. The main issue here is to look into the functional relationship between industrial growth and higher education expansion. Our independent variables are higher institutions expansion proxy by graduates of higher institutions (GTO), students' enrolment into higher institution (TER), government recurrent expenditure on education (GRE) and Government capital expenditure on education (GCE).

Data Sources and Estimation Procedure

The data used for this study were obtained from 2008 Central Bank of Nigeria statistical bulletin and 2007 social statistics in Nigeria by National Bureau of Statistics. Data utilised covered 1977 - 2007 period. The estimation methodology entailed descriptive statistics and ordinary least square regression method.

Empirical Results

The results in Table 4 below show that all the variables are widely dispersed with the values of their standard deviations.

$$\ln A = b + \beta_4 \cdot \ln h_t + \beta_5 \cdot TER_t + \beta_6 \cdot GCE_t + \beta_7 \cdot GRE_t + U_t \quad (6)$$

Where b is the exogenous technological progress, h_t is the level of human capital proxy by graduate turnout; TER_t is the tertiary school enrolment; GRE is the government recurrent expenditure on education and GCE is the government capital expenditure on education. We expect the level of human capital proxy by graduate turnout, tertiary school enrolment, government recurrent expenditure on education and government capital expenditure on education to have positive effect on total industrial output. Given the above discussion, the above model is modified for the present study as follows:

Table 4: Descriptive Statistics of the Variables

Variables	Observation	Mean	Standard Deviation	Min.	Max
Industrial Output	31	4040798	5946250	1. 31520.34	2.33e+07
Graduate Turn-Out	31	709325.6	925744	47050	4585963
Tertiary Institution Enrolment	31	789627.8	638479.3	297519	3500000
Government Reccurrent Educational Expenditure	31	23141.51	33471.79	151.23	107529
Government Capital Educational Expenditure	31	7798.742	12203.89	139.1	48293.5

A test of coefficient of correlation in Table 5 below between industrial output, graduate turn-out, tertiary institution enrolment, government recurrent educational expenditure and government capital educational expenditure show that all variables are strongly correlated. Table 5 shows that growth of industrial output is highly and positively correlated with graduate turn-out and tertiary institution enrolment with a coefficient of correlation of 0.7210 and 0.9018 respectively and is also positively correlated with government recurrent educational expenditure and government capital educational expenditure with a correlation coefficient of 0.9481 and 0.9672.

Table 5: Coefficient of Correlation of the Variables

	Industrial Output	Graduate Turn-Out	Tertiary Institution Enrolment	Government Reccurent Educational Expenditure	Government Capital Educational Expenditure
Industrial Output	1.0000				
Graduate Turn-Out	0.7210	1.0000			
Tertiary Institution Enrolment	0.9018	0.6297	1.0000		
Government Reccurent Educational Expenditure	0.9481	0.7626	0.8166	1.0000	
Government Capital Educational Expenditure	0.9672	0.6485	0.8465	0.9129	1.0000

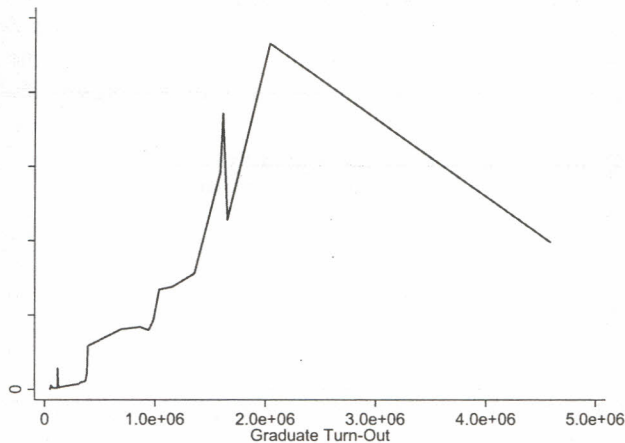


Figure 3: Industrial Output and Graduate Turn-Out

Figure 3 shows that total industrial output and graduate turn-out are positively related.

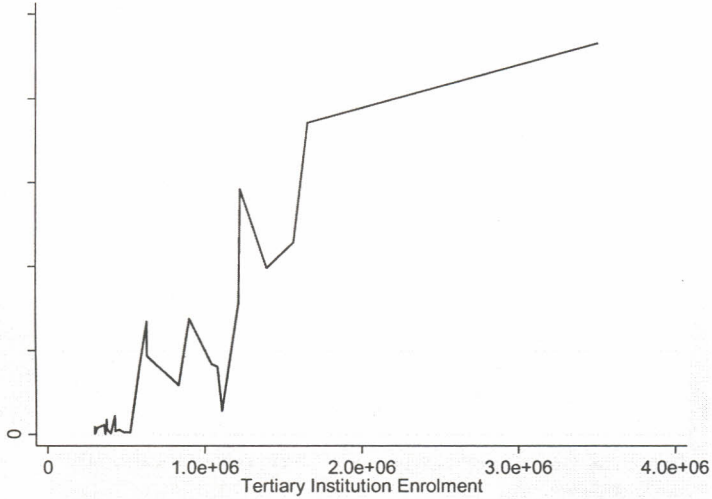


Figure 4: Industrial Output and Tertiary Institution Enrolment

Figure 4 also shows a direct relationship between total industrial output and tertiary institution enrolment.

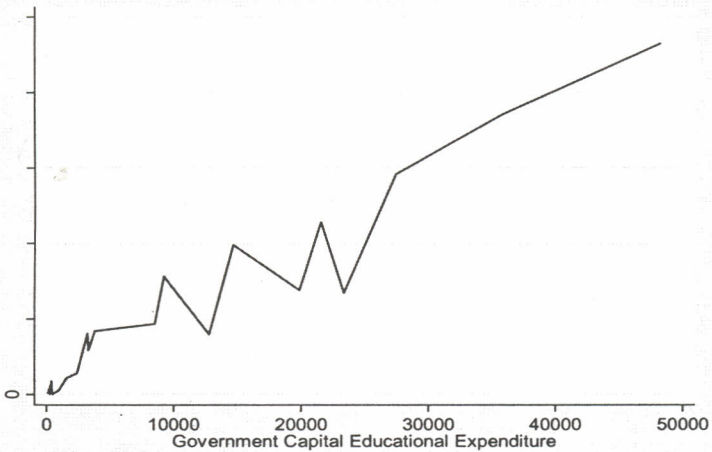


Figure 5: Industrial Output and Government Capital Educational Expenditure

Figure 5 also indicates a positive relationship between total industrial output and government educational capital expenditure. Though the relationship appears unstable.

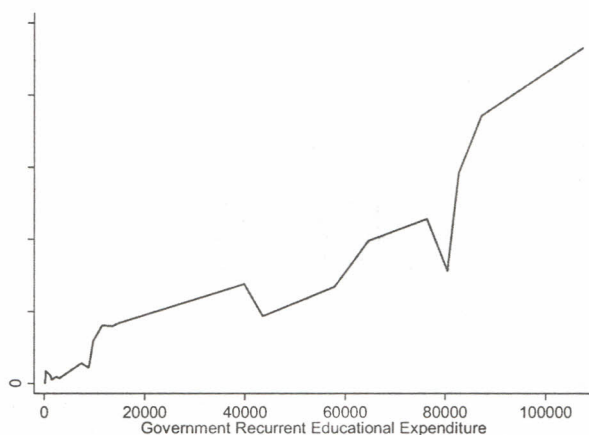


Figure 6: Industrial Output and Government Recurrent Educational Expenditure

Figure 6 also shows a positive relationship between total industrial output and government recurrent expenditure. Though there appears to be an unstable relationship between total industrial output and graduate turn-out, tertiary institution enrolment, government capital expenditure and government recurrent expenditure but all the graphs still indicate a direct relationship among all these variables. This implies that all other things being equal an increase in any of the index of higher education expansion will lead to an increase in total industrial output.

Table 7: Ordinary Least Square Estimation of Effect of Higher Education Expansion on Industrial Output (Dependent Variable is LOG of Total Industrial Output)

Variables	Coefficients	$P > t$	BETA
<i>LGTO</i>	0.6771809 (3.99)	0.000*	0.4264781
<i>LTER</i>	0.4455326 (1.81)	0.083**	0.1306343
<i>LGRE</i>	0.272562 (2.33)	0.028***	0.3327742
<i>LGCE</i>	0.1553165 (1.31)	0.202	0.1442887
<i>CONSTANT</i>	-4.216639 (-1.35)	0.187	
<i>R-Squared</i>	0.9575		
<i>F</i>	146.42 (0.0000)		

*significant at 1%, **significant at 10%, ***significant at 5%level

The result of robust ordinary least square regression in table 7 shows the functional relationship between total industrial output and higher education expansion. The result shows that the growth of industrial output and higher education expansion are positively related. Higher education expansion and graduate turn-out are positively related with coefficient 0.68. It shows that if graduate turn-out increase by one unit, industrial output will increase by 68%. This is significant at 99% level. Also, an increase in tertiary

institution enrolment, government education recurrent expenditure and government education capital expenditure by one unit, other things being equal will increase industrial output 45%, 27% and 16% respectively. However, only tertiary institution enrolment and government education recurrent expenditure are significant at 10% and 5% significant level. The result of R-squared also indicates that higher education expansion explained 96% variation in total industrial output.

Conclusion and Policy Recommendation

This study examined the functional relationship between higher education expansion and industrial growth in Nigeria. The variables employed for the study are graduate turnout, tertiary institutions enrolment, government recurrent expenditure on education and government capital expenditure on education to proxy higher education expansion and real total industrial output to proxy industrial growth. The study shows the existence of positive relationship between higher education expansion and industrial growth. This shows that an increase in the number of graduates other things being equal would increase the real industrial income among others. The policy implication of this is that more attention should be paid to the expansion of facilities in tertiary institutions to produce quality graduates as the economy grows. It is therefore important that government give adequate attention to the growth of tertiary education in Nigeria for speedy growth and development.

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